stant stream of pure water could be run through the sample and collected for evaporation to a suitable volume would likely be the best method for determining relative water solubility.

Laboratory Preparation of Lead Ortho-arsenate.—Very few American chemists appear to have experimented with the ortho-arsenate of lead. Probably this is due to the fact that the formulas most often published do not produce this compound in the pure state, that is: unmixed with acid arsenates. True ortho-arsenate may be prepared as follows:

Solutions of lead acetate or nitrate and arsenic acid or ammonium, sodium or potassium arsenate containing the correct weights of the oxides (1 part of As_2O_5 to 2.90 PbO) are poured together. The water should be sufficient to dilute the precipitate so that it will not form too thick a mass. To this mixture ammonia is added to strong alkalinity. The mixture is digested with gentle heat for an hour or more, allowed to settle, and the clear liquid tested for arsenic oxide as described under the ammonia test. If a precipitate forms, a little more lead solution is added and the procedure repeated until no precipitate appears. It is well to wash the finished product and again treat with ammonia. If any arsenic oxide appears in the filtrate more lead solution should be added. Finally wash to the complete removal of water-soluble salts. In accordance with well-known principles of chemistry the retention of the arsenic oxide will not be complete until there is an excess of the precipitant, that is, lead oxide. For this reason true ortho samples will show less than the theoretical percentage of arsenic oxide (25.59 per cent.). With commercial samples, where allowance has to be made for impurities, this percentage is still further reduced.

It appears, then, that the federal insecticide and fungicide law rules out commercial ortho-arsenate of lead prepared on a 50-per-cent. water basis, by requiring 12.5 per cent. arsenic oxide. The manufacturers may still comply with the law by reducing the water percentage, but this is done at expense of easy remixing, so working a hardship on the consumer. It is my opinion that this clause in the act should be amended to read: "In the case of strictly ortho-arsenate of lead, the arsenic oxide content shall not be less than 11 per cent. or more than 12.5 per cent. on a 50-per-cent. water basis."

Further Discussion of Water.—Haywood, as already cited, has shown that chlorides, carbonates and sulphates may seriously increase arsenical injury from acid and pyro-ortho mixtures even when present in comparatively small amounts. Some recent results with these arsenates in commercial spraying apparently bear out such conclusions. The commercial ortho-arsenate usually contains enough excess lead oxide to offset these effects, but cases can be imagined where this compound might be partly decomposed. In such instances it is clearly possible to overcome the difficulty by treating the water with lead acetate. The addition of lead acetate until the water shows a reaction for soluble lead should give the desired result. The presence of small amounts of lead acetate will not prove injurious, and we have applied the carbonate and sulphate in very large quantities without producing the slightest injury. Lead acetate will completely overcome the effects of carbonates and sulphates and should greatly reduce the solvent action of chlorides.

Acknowledgments.—The investigations of which the features of this discussion form a part have had a wide scope and important contributions have been made by several people, among whom may be mentioned Professors C. W. Woodworth, W. T. Clarke, Geo. E. Colby and Mr. E. E. Luther.

W. H. VOLCK

WATSONVILLE, CAL.

SOCIETIES AND ACADEMIES

THE WASHINGTON ACADEMY OF SCIENCES

THE Washington Academy of Sciences held its 71st meeting in the auditorium of the New National Museum on the evening of April 18, 1911. President F. W. Clarke presided.

Sir John Murray, of Scotland, gave a most interesting and beautifully illustrated lecture on "The Ocean."

Maps were shown that gave the depths of the several oceans, the directions of their currents, their temperatures at all depths, their salinity, density and other physical conditions. The importance of each of these phenomena was clearly stated and their interdependence carefully explained. It was explained, for instance, that life at considerable depths in the sea is dependent upon vertical circulation, because in this way only is it possible to bring to the lower portions the necessary amount of oxygen. This explains the absence of life in the deeper portions of the Black Sea in which the distribution of density is such that it produces horizontal currents only.

Even those portions of the ocean farthest removed from land have an abundance of animal life, which in the last analysis must live upon vegetable matter. But this, the lecturer explained, is everywhere present in such abundance, though consisting of microscopic individuals, that the oceans may be thought of as vast meadows containing even more vegetable matter than is upon the land.

A most interesting and possibly important fact is the change, after a lapse of a few years, in the temperature of the deeper layers of the sargasso sea. These temperatures should be taken several times a year for a number of years, for the purpose of determining whether the change is cyclic, and what its causes and its consequences are.

These are only some of the topics discussed in a lecture that combined in the highest degree the interesting and the instructive.

THE 70th meeting of the Washington Academy of Sciences was held in the assembly room of the Cosmos Club at 8:15 P.M., March 30, 1911. President F. W. Clarke presided.

Professor Dr. Victor Goldschmidt, professor of mineralogy in the University of Heidelberg, Germany, presented a paper on "The Nature of Crystals."

The lecturer began with humorous descriptions of school-day experiences when we studied crystallography by the aid of painted wooden and pasteboard models, and from them got the idea that real crystals were mighty poor imitations of our beautiful wooden blocks.

By way of emphasizing the importance of the subject of crystallography it was stated that all ice and snow, all rocks whether of mountains or in the deep strata of plains, the moon, wandering meteors and all solids from liquids, are crystals.

A philosophical and all-comprehensive definition of crystals was then developed, and contrasted with the similar definition of a liquid. A crystal was defined as being: "A solid system of like particles with like orientation." A liquid was defined as "A system of gliding and rotating particles."

Any one who thinks crystallography either an unworthy or uninteresting subject is very much mistaken, Dr. Goldschmidt declared, and by his lecture, in the opinion of all who heard him, made good this claim.

W. J. HUMPHREYS,
Secretary

THE BOTANICAL SOCIETY OF WASHINGTON

THE 73d regular meeting of the society was held at the Cosmos Club, Tuesday, May 2, 1911, at eight o'clock P.M. President W. J. Spillman presided. Thirty-one members were present.

Mr. Walter T. Swingle presented a review of a recent paper by de Vries entitled "Ueber doppeltreziproke Bastarde von *Œnothera biennis* L. und *O. muricata* L.," in *Biologisches Centralblatt*, 31: 97–104, No. 4, February 15, 1911. This review will appear in full in SCIENCE.

The following papers were read:

The Recent Excursion into the Dismal Swamp: F. V. COVILLE.

After describing an excursion made by the Washington Academy of Sciences into the Dismal Swamp of Virginia, April 28–30, 1911, the author discussed the characteristic plant associations of the Dismal Swamp which are those of the "black gum" and the "juniper" areas, the latter being of unusual ecological interest.

The "juniper" lands of the Dismal Swamp have a special flora different from the other floras of the region. The characteristic tree is the southern white cedar (*Chamæcyparis thyoides*), locally known as "juniper." The common shrubs are swamp blueberry (*Vaccinium corymbosum*), white alder (*Clethra alnifolia*), inkberry (*Ilex glabra*), fetterbush (*Pieris nitida*), and various other species belonging to the heather family. The soil is a red-brown peat, made up of the dead roots, twigs and leaves of the swamp vegetation. The water of these juniper swamps contains a remarkably small quantity of mineral matter, and has the color of tea, due to a dilute solution of organic matter derived from the peat. When tested with phenolphthalein the water gives an acid reaction, to the degree of .0005 of a normal acid solution. The peculiar flora of the juniper swamp

is attributed to the acidity of this water and of the peat from which it flows, the chemical qualities of the water preventing the growth of the organisms of decay, and preserving the soil in such a condition of acidity as to make it impossible for ordinary swamp plants to grow on these lands. The "juniper" trees and other vegetation of these areas are specially resistant to acidity and are able to grow with luxuriance in such a situation. The antiseptic quality of this water is further attested by the estimation in which it has long been held among sailors for drinking purposes. Before the days of distilled sea water, the favorite water supply of ships leaving Norfolk on a long voyage was "juniper" water from the Dismal Swamp. No other water was so highly esteemed and none kept its sweetness so well.

The Effect of the Reaction of Solutions on the Growth of Wheat Seedlings: J. F. Brezeale and J. A. Le Clerc. (Read by Dr. Le Clerc.)

The authors showed, by the use of lantern slides of photographs of seedlings grown in various solutions, that the development of the roots of the seedlings was injuriously affected by all the solutions that had become appreciably acid in reaction. This acid reaction was most marked with the application of KCl and K_2SO_4, the plant exerting a selective action for the K ion, thus leaving the acid radicle Cl or SO_4 behind, which in turn made the culture-medium acid by which the growth of the roots was stunted. The conclusion was drawn that the reaction of the solution played a most important rôle in the development of the seedlings.

Some Changes which take Place in Stored Grain: Dr. J. W. T. Duvel.

This paper treated mainly of the more important changes which take place in commercial corn during storage in grain elevators and holds of steamships. Corn thus stored frequently contains relatively high percentages of moisture, thus affording an excellent opportunity for the development of molds and bacteria. The development of these organisms, together with the action of unorganized ferments, is accompanied by a distinct and rapid increase in temperature and a marked deterioration in the grain. Such grain is known commercially as "heating" or "hot" and after it starts to go "out of condition" it usually reaches a temperature of from 135° to 150° F. within a very few days. The viability is greatly reduced or entirely destroyed, and there is a marked increase in the acidity, a reduction in the percentage of both sucrose and invert sugar, and a considerable loss in fat. Other important changes also occur in the chemical composition of the grain, together with a heavy loss in weight and a lowering in the weight per bushel.

W. W. Stockberger,
Corresponding Secretary

The Association of Teachers of Mathematics in the Middle States and Maryland

The sixteenth meeting of the association was held in Teachers College, New York, April 22, 1911. The meeting was called to order by the president, Dr. Wm. H. Metzler, at 10:30 A.M. in the chapel of the college.

After the reading of the minutes, Mr. Breckenridge, chairman of the committee on continuation schools, reported the progress of his committee. The report was very interesting in the matter of the attitude of the students in those schools for more pure mathematics, merely because of their place in the curriculum of the ordinary day school. The report was accepted and the committee was continued. The algebra syllabus committee was also continued.

The first paper of the morning was given by J. S. Rorer, of the Wm. Penn High School, Philadelphia, on "The Curriculum: Present Tendencies, Future Possibilities."

The work of the morning was concluded by a paper by A. M. Curtis, of the Oneonta Normal School, on "Study Supervision: Its Needs in the Mathematics of the Elementary and Secondary Schools."

The first paper of the afternoon was a description, with lecture table models, of the slide rule and its uses, by Clifford B. Upton, of Teachers College. This was followed by a description, with stereopticon illustrations, of the calculating machines then on exhibition in the educational museum of Teachers College.

Preliminary reports for the committees on arithmetic, algebra and geometry were given by Mr. Rorer for the committee on arithmetic and by Mr. Durrell for the committee on geometry. These reports consisted of plans for carrying on the work.

After expressing its thanks to Teachers College the meeting adjourned to the educational museum for the privilege of inspecting the exhibition of slide rules, calculating machines, rare books and manuscripts.

H. F. Hart,
Secretary